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***In Situ* Curvature and Stress Analyses for Sputtered WSi₂/Si Multilayer Thin Films on Silicon Wafers[†]**

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Multilayered thin films with layer thicknesses of a few nanometers have numerous applications including x-ray mirrors, MEMS/NEMS structures, and semiconductor heterostructures. A particular application of interest presently is sputtering of multilayer-Laue lenses [1, 2]. Several x-ray optics groups are interested in multilayer thin films for focusing x-rays. Stress develops layer by layer during growth. High stress from the multilayers can have adverse effects; for example, it can result in delamination. We report on a study of wafer curvature of dc magnetron sputtered amorphous WSi₂/Si bilayers on Si wafers. Sputtering was interrupted and wafer curvature was measured *in situ* five times per layer with a laser-based optical system. Stoney's equation was used to analyze the curvature. The variables studied were: 1) substrate orientation, 2) substrate wafer rotation with respect to the wafer flat, and 3) Ar plasma pressure in the deposition chamber. Results show that clamping influences did not distort the data and that layers grown at lower pressures were in compression while layers at higher pressures were in tension. Similarly to other sputter deposited materials, there is a quick transition between compressive and tensile stress as plasma pressure is increased. It is found that during deposition the sputtered Si layer was more stressed than the WSi₂ layer.

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2. H. C. Kang, H. Yan, R. Winarski, M. V. Holt, J. Maser, C. Liu, R. Conley, S. Vogt, and A. T. Macrander, *Appl. Phys. Lett.*, **92**, 221114 (2008).

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